3GPP TSG-RAN WG4 Meeting #109 R4-23xxxxx

Chicago, US, November 13 – 17, 2023

**Agenda item:** 8.8.6

**Source:** Moderator (Apple)

**Title:** Topic summary for [109][208] NR\_RRM\_enh3\_part1

**Document for:** Information

# Introduction

This topic summary includes general and work plan (8.8.1), RRM core requirements for FR2 SCell activation delay reduction (8.8.2), and RRM performance requirements for FR2 SCell activation delay reduction (8.8.4).

*List of candidate target of discussions for this topic.*

* Mainly discuss on
	+ Issue 1-1, issue 1-3, issue 1-2, issue 1-4, issue 2-1-1, issue 2-2-1, issue 2-3-1, issue 3-2-4, issue 3-2-5, issue 3-2-2, issue 3-2-6
	+ Then other issues..

# Topic #1: Enhancement for FR2 SCell activation

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2318646](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318646.zip) | Apple | Proposal 1: RAN4 to not discuss whether SCell activation triggered L3 measurement report is configured/reported per FR2 band.Proposal 2: PL-RS measurement sample number in R18 FR2 unknown PUCCH SCell activation enhancement is same as R17 PUCCH SCell activation, i.e., 3\*Ttarget\_PL-RS.Proposal 3: “Performing L1-RSRP measurement in non-DRX mode even DRX is configured” can also be applied for FR1 SCell activation. |
| [R4-2319004](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319004.zip) | Nokia, Nokia Shanghai Bell | Observation 1: The legacy SCell activation procedure shall not be extended by the 4ms processing time. Observation 2: M shall be set to the maximum value of the two i.e. *max (THARQ + 3ms +4ms, X1\*Tssb+X2\*Tssb).*Observation 3: If UL grant for the L3 report comes after L1-RSRP measurement but before the L1-RSRP report, the UE shall be able to send the L3 report to speed up the SCell activation.Proposal #1: The time margin beyond which UE is not required to send the L3 report shall include the time for L1-RSRP report i.e. TL1-RSRP,report.Proposal #2: The value of M is set as the following:* *M = max (THARQ + 3ms +4ms, X1\*Tssb+X2\*Tssb+[* TL1-RSRP,report*])*, if UE indicates capability of using SSB periodicity instead of SMTC periodicity
* Otherwise, *M = max (THARQ + 3ms +4ms, X1\*Tsmtc+X2\*Tssb +[TL1-RSRP,report])*

Proposal #3: For FR1, *M = max (THARQ + 3ms +4ms, Trs+ TL1-RSRP,measure + [TL1-RSRP,report])*.Observation 4: The valid measurement results of any of the SCells on the same FR2 band can help the SCell activation. Proposal #4: UE does not need to report L3 measurement resulting if UE has no valid measurement results for any of the SCells on the same FR2 band.Proposal #5: The SCell activation triggered L3 report is considered when determining known/unknown state in the same way as legacy L3 measurement reporting. |
| [R4-2319006](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319006.zip) | Nokia, Nokia Shanghai Bell | Draft CR on SCell activation Triggered Reporting (section 9.2.4.X) |
| [R4-2319049](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319049.zip) | vivo | Observation 1 The newly introduced 4ms is the UE requirements for processing time for preparing L3 report triggered by MAC CE considering the worst case. It shall not be a fixed value.Proposal 1 Confirm that 4ms is the processing time for preparing L3 report triggered by MAC CE, and remove the following in draft CR.* ‘UE is expected to report the L3 results no earlier than 7ms + THARQ after receiving the SCell activation command.’
 |
| [R4-2319050](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319050.zip) | vivo | Draft CR on SCell activation Triggered Reporting (section 9.2.4.X) |
| [R4-2319355](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319355.zip) | Huawei, HiSilicon | Observation 1: If there is more than one MOs configured within same band, UE will report all measurement report upon receiving SCell activation command. NW has no idea which one is the latest one when receiving multiple L3 report within the same FR2 band.Proposal 1: RAN4 to discuss the following case:When more than one servingCellMOs are configured within the same band and UE report multiple report upon receiving SCell activation command, whether UE should report multiple report if the report beams are different and how to configure the TCI for SCell activation. |
| [R4-2319356](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319356.zip) | Huawei, HiSilicon | Draft CR |
| [R4-2319469](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319469.zip) | OPPO | *Proposal 1: UE capabilities for the feature of unknown SCell activation enhancement in R18 eFeRRM WI are defined as:*

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| --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Type | Mandatory/Optional |
| x.RRM\_enh3 | x-1 | Enhanced L3 measurement report for unknown SCell activation | Support of reporting valid L3 measurement results for the target being-activated SCell after receiving the SCell activation command | Per UE | Optional with capability signaling |
| x-2 | Beam sweeping factor reduction  | Support of reducing beam sweeping factor for cell detection and SSB based L1-RSRP measurement during AGC settling part during FR2-1 unknown SCell activation  | Per Band | Optional with capability signaling |
| x-3 | Other measurement enhancement for unknown SCell activation | Support of using SSB periodicity instead of SMTC periodicity for the measurement interval during unknown SCell activation Support of performing L1-RSRP measurement in non-DRX mode  | Per Band | Optional with capability signaling |

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| [R4-2320419](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320419.zip) | ZTE Corporation | Proposal 1: No need to introduce any constraint from RAN4 perspective, RAN2 would decide this.  |
| [R4-2320435](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320435.zip) | ZTE Corporation | Draft CR on multi-SCell activation with L3 reporting |
| [R4-2320483](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320483.zip) | Qualcomm Incorporated | Proposal: Single measurement report is expected even for multiple SCell activation scenario. Proposal: RAN4 does not introduce further enhancement for unknown PUCCH SCell activation.  |
| [R4-2320484](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320484.zip) | Qualcomm Incorporated | Draft CR on FR2 unknown SCell activation with L3 report  |
| [R4-2320485](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320485.zip) | Qualcomm Incorporated | Draft CR on SCell activation Triggered Reporting (section 9.2.4.X) |
| R4-2320519 | ZTE Corporation |  |
| [R4-2320764](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320764.zip) | Ericsson | Proposal 1: RAN4 not to change the RAN2 signalling design of L3 measurement report upon SCell activation command. |
| [R4-2320765](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320765.zip) | Ericsson | Draft CR to Direct SCell activation |
| [R4-2321004](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2321004.zip) | MediaTek inc. | Proposal 1: UE is not expected to report L3 measurement report during (THARQ + 3ms + 4ms). |
| [**R4-2319005**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319005.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: If all the to-be-activated SCells belong to FR2 and on the same band, the activation delay for activating these multiple SCells is:* + the same as the enhanced FR2 SCell activation delay in clause 8.3.x provided the UE triggers the L3 report for at least one of the SCells to be activated after SCell activation command, or
	+ the same as the single SCell activation delay in clause 8.3.2, otherwise.

Observation #1: When activating multiple FR1 SCells, the activation delay is linearly increasing with the number of unknown to-be-activated SCells i.e., N1 for cell search.Proposal 2: For multiple FR1 SCells, the adaptation of the "N1" definition is required to align with the advantages derived from sending an L3 report after SCell activation command.Proposal 3: N1 shall not count for the FR1 unknown to-be-activated SCells which have been reported or contiguous to the SCells reported in the L3 report after SCell activation command. Proposal 4: R18 enhancement solutions are applicable to PUCCH SCell activation by referring to the enhanced SCell activation delay in the new clause 8.3.x for UE configured with *[reportOnactivation]*. Observation #2: When the UE indicates X2=0, the L1-RSRP report is derived from L3 measurement during former SCell activation steps without dedicated narrow-beam based measurements.Proposal 5: If the UE indicates X2=0, the PL-RS measurement shall be skipped during PUCCH SCell activation.  |
| [**R4-2319007**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319007.zip) | Nokia, Nokia Shanghai Bell | Draft CR on enhancement for PUCCH SCell activation |
| [**R4-2319099**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319099.zip) | CMCC | Proposal 2: it is proposed that the enhancement of performing L1-RSRP measurement in non-DRX mode even DRX is configured is applied for FR1 SCell activation delay. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

**Issue 1-1: delay requirement or time margin for “L3 measurement reporting after SCell activation command”?**

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| --- |
| *Agreement in RAN4#108bis meeting R4-2317350** Agreements:
	+ UE is ready to report the L3 report after SCell activation command on *N +* *THARQ* + 3ms + 4 ms.
		- Note: The uncertainty of available UL resource for L3 report is not counted.
		- [4 ms is the processing time for preparing L3 report triggered by MAC CE.]
* Agreement:
	+ *UE is not required to report L3-RSRP report after exceeding [Y]ms*
		- *Where Y= THARQ + 3ms + [M]ms,*
			* *M = 4ms + X1\*Tssb+X2\*Tssb, if UE indicates capability of using SSB periodicity instead of SMTC periodicity*
			* *Otherwise, M = 4ms + X1\*Tsmtc+X2\*Tssb*
 |

* Option 1 (Nokia):
	+ The time margin beyond which UE is not required to send the L3 report shall include the time for L1-RSRP report i.e. TL1-RSRP,report.
	+ The value of M is set as the following:
		- *M = max (THARQ + 3ms +4ms, X1\*Tssb+X2\*Tssb+[* TL1-RSRP,report*])*, if UE indicates capability of using SSB periodicity instead of SMTC periodicity
		- Otherwise, *M = max (THARQ + 3ms +4ms, X1\*Tsmtc+X2\*Tssb +[TL1-RSRP,report])*
	+ For FR1, *M = max (THARQ + 3ms +4ms, Trs+ TL1-RSRP,measure + [TL1-RSRP,report])*.
* Option 2 (vivo):
	+ Confirm that 4ms is the processing time for preparing L3 report triggered by MAC CE, and remove the following in draft CR.
		- ‘UE is expected to report the L3 results no earlier than 7ms + THARQ after receiving the SCell activation command.’
* Option 3 (MTK):
	+ - UE is not expected to report L3 measurement report during (THARQ + 3ms + 4ms).
* Recommended WF:
	+ FFS on above options.
	+ [Moderator note]: For option 2 and 3, regarding different UE implementations (some UEs may need less processing time), it could be “UE is expected to report the L3 results no later than 7ms + THARQ after receiving the SCell activation command”. Please companies double check.
		- Option 4 (Moderator): UE is expected to report the L3 results no later than 7ms + THARQ after receiving the SCell activation command

**Issue 1-2: Whether SCell activation triggered L3 report is on one serving cell in same band or on all serving cells**

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| *RAN2 agreement in #123bis meeting:**Agreements:**1. If the network activates multiple Scells within same MAC CE the UE may send only one measurement report.**Previous agreement in RAN4 #107 R4-2310081**Issue 1-1-2: waiting RAN2 conclusions for when/how/what to report L3 measurement results for unknown FR2 SCell activation enhancement (previous issue 1-1-1, 1-1-2, 1-1-3, 1-1-4, 1-1-5 in R4-2306315), except the FFS for additional solution in issue 1-1-1** *Agreement:*
	+ *RAN4 to wait for RAN2 conclusion on triggering/configuration/reporting, and there is no need to have further discussion in RAN4.*

*Previous agreement in RAN4 #106bis R4-2306315**Issue 1-1-4: FFS on how to report L3 measurement result for unknown FR2 SCell activation enhancement** *Agreement:*
	+ *Send LS (R4-2306321) to let RAN2 to decide.*

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| * *Technical enhancement goal: RAN4 had following agreements in RAN4 #106-bis-e meeting,*

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| * *Agreements (GTW, Monday Apr 17, 2023)*
	+ *UE needs to report the L3 measurement result after SCell activation command*
	+ *FFS if additional solutions should be considered. Decision on additional solutions need to be made no later that in RAN4 #107.*
 |

* *Action Request to RAN2: RAN4 requests RAN2 to design corresponding signaling for “report of L3 measurement result” after SCell activation command for unknown FR2 SCell activation enhancement, and it’s up to RAN2’s decision on which layer’s signaling shall be used.*
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* Proposals
	+ Option 1 (Apple, ZTE, Ericsson, QC): RAN4 to not discuss the RAN2 signalling design of L3 measurement report upon SCell activation command, i.e., whether L3 report is on one serving cell in same band or on all serving cells.
	+ Option 2 (Nokia):
		- UE does not need to report L3 measurement resulting if UE has no valid measurement results for any of the SCells on the same FR2 band.
		- The SCell activation triggered L3 report is considered when determining known/unknown state in the same way as legacy L3 measurement reporting.
	+ Option 3 (HW): RAN4 to discuss the following case:
		- When more than one servingCellMOs are configured within the same band and UE report multiple report upon receiving SCell activation command, whether UE should report multiple report if the report beams are different and how to configure the TCI for SCell activation.
* Recommended WF
	+ [Moderator]: According to the previous agreements, this issue can be left to RAN2 for decision. Please companies double check if we really need to open further discussion in RAN4.

**Issue 1-3: FR2 unknown PUCCH SCell activation enhancement**

* Option 1 (Apple, QC):
	+ PL-RS measurement sample number in R18 FR2 unknown PUCCH SCell activation enhancement is same as R17 PUCCH SCell activation, i.e., 3\*Ttarget\_PL-RS.
* Option 2 (Nokia):
	+ R18 enhancement solutions are applicable to PUCCH SCell activation by referring to the enhanced SCell activation delay in the new clause 8.3.x for UE configured with *[reportOnactivation]*.
	+ If the UE indicates X2=0, the PL-RS measurement shall be skipped during PUCCH SCell activation.
* Recommended WF
	+ TBA

**Issue 1-4: detailed delay requirement with reporting valid L3 measurement after SCell activation command (multiple SCell activation)**

* Option 1 (Nokia):
	+ If all the to-be-activated SCells belong to FR2 and on the same band, the activation delay for activating these multiple SCells is:
		- the same as the enhanced FR2 SCell activation delay in clause 8.3.x provided the UE triggers the L3 report for at least one of the SCells to be activated after SCell activation command, or
		- the same as the single SCell activation delay in clause 8.3.2, otherwise.
	+ For multiple FR1 SCells, the adaptation of the "N1" definition is required to align with the advantages derived from sending an L3 report after SCell activation command.
	+ N1 shall not count for the FR1 unknown to-be-activated SCells which have been reported or contiguous to the SCells reported in the L3 report after SCell activation command.
* Recommended WF
	+ [Moderator]: Like in last meeting issue 1-1-7, recommend to directly discuss in draft CR since in previous meeting companies’ understand was: the single SCell activation enhancement case can be reused by multiple SCell activation case without introducing any new technical issue.

**Issue 1-5: “Performing L1-RSRP measurement in non-DRX mode even DRX is configured” for FR1 SCell activation**

* Option 1 (Apple, CMCC, CTC):
	+ “Performing L1-RSRP measurement in non-DRX mode even DRX is configured” can also be applied for FR1 SCell activation
* Recommended WF
	+ Agree on option 1.

# Topic #2: UE capability design

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318647**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318647.zip) | Apple | Proposal 1: UE capability of enhancement L3 report after SCell activation command shall be:* per-UE capability
* no difference between FR1 and FR2, and between TDD and FDD
* appliable for single SCell activation, single PUCCH SCell activation, and multiple SCell and PUCCH SCell activation

Proposal 2: UE capability of beam sweeping factor reduction for L3 and L1 (X1 and X2) shall be:* per-band capability
* only appliable for FR2, and TDD only
* Two beam sweeping factor reduction capability for L3 and L1, respectively, to indicate beam sweeping factor capability of X1 for cell detection part (X1\*Trs) and beam sweeping factor capability of X2 for SSB based L1-RSRP measurement.

Proposal 3: UE capability of “using SSB periodicity instead of SMTC” and “perform L1-RSRP measurement in non-DRX mode even DRX is configured” shall be:* per-UE capability
* no difference between FR1 and FR2, and between TDD and FDD
 |
| [**R4-2319099**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319099.zip) | CMCC | Proposal 1: for X1 and X2 are proposed as per UE capability.Proposal 3: for the enhancement applied to both FR2 and FR1 SCell activation delay, it is proposed that these related UE capabilities are applied for both FR1 and FR2, no need to have seperate capability.* L3 measurement report after SCell activation command,
* using SSB periodicity instead of SMTC periodicity and performing L1-RSRP measurement in non-DRX mode even DRX is configured,
 |
| [**R4-2319518**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319518.zip) | China Telecom | Proposal 1: For UE capability of enhancement L3 report after SCell activation command, the capability can be applied for FR1 and FR2.Proposal 2: For UE capability of enhancement L3 report after SCell activation command, per UE indication can be introduced.Proposal 3: For capability of beam sweeping factor reduction for L3 and L1 (X1 and X2), per band indication can be introduced. |
| [**R4-2320766**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320766.zip) | Ericsson | Proposal 1: UE capability of sending L3 report after SCell activation command to be introduced as per-UEProposal 2: For X1 and X2, introduce per band capability indication. |
| [**R4-2321005**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2321005.zip) | MediaTek inc. | Proposal 1: Introduce the following feature group for R18 FR2 SCell activation enhancement(Table in this discussion paper) |
| [R4-2319049](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319049.zip) | vivo | Proposal 2 All UE features in this SCell activation enhancements should have FR1/FR2 differentiation.Proposal 3 For feature group of beam sweeping factor reduction, the capability should be per-band-per-BC. |
| [R4-2319355](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319355.zip) | Huawei, HiSilicon | Proposal 2: UE capability of enhancement L3 report after SCell activation command apply to single SCell activation, single PUCCH SCell activation, multiple SCell activation with/without PUCCH SCell.Proposal 3: For capability of beam sweeping factor reduction for L3 and L1 (X1 and X2), introduce per band capability indication |
| [R4-2319469](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319469.zip) | OPPO | *Proposal 1: UE capabilities for the feature of unknown SCell activation enhancement in R18 eFeRRM WI are defined as:*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Type | Mandatory/Optional |
| x.RRM\_enh3 | x-1 | Enhanced L3 measurement report for unknown SCell activation | Support of reporting valid L3 measurement results for the target being-activated SCell after receiving the SCell activation command | Per UE | Optional with capability signaling |
| x-2 | Beam sweeping factor reduction  | Support of reducing beam sweeping factor for cell detection and SSB based L1-RSRP measurement during AGC settling part during FR2-1 unknown SCell activation  | Per Band | Optional with capability signaling |
| x-3 | Other measurement enhancement for unknown SCell activation | Support of using SSB periodicity instead of SMTC periodicity for the measurement interval during unknown SCell activation Support of performing L1-RSRP measurement in non-DRX mode  | Per Band | Optional with capability signaling |

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*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Agreements in RAN4#108bis meeting

|  |
| --- |
| Issue 3-1-1: UE capability of enhancement L3 report after SCell activation command* Agreement:
	+ this feature shall be defined in one single feature group (FR) of feature list and it’s optional with capability signaling

Issue 3-1-2: capability of beam sweeping factor reduction for L3 and L1 (X1 and X2) * Agreement:
	+ this feature (X1/X2) shall be defined in one single feature group (FR) of feature list
	+ define UE capability of beam sweeping factor reduction for L3 and L1 (X1 and X2)
		- It’s Optional with capability signaling.

Issue 3-1-3: capability of “using SSB periodicity instead of SMTC” and “perform L1-RSRP measurement in non-DRX mode even DRX is configured” * Agreement:
	+ “using SSB periodicity instead of SMTC” and “perform L1-RSRP measurement in non-DRX mode even DRX is configured” shall be defined in one single feature group (FR) of feature list
		- Define this feature as “optional with capability signaling”
 |

### Sub-topic 2-1 UE capability for L3 report after SCell activation command

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 2-1-1: UE capability of L3 report after SCell activation command**

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| --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** |
| 31. NR\_RRM\_enh3 | 31-1 | Enhanced L3 measurement report for unknown SCell activation | Option 1: Per UE (Apple, CTC, Ericsson, OPPO, MTK) | Option 1: No (Apple, MTK) | Option 1: No (Apple, CMCC, CTC, MTK)Option 2: Yes (vivo) |

* Recommended WF
	+ Agree on option1 for column “Type” and “Need of FDD/TDD differentiation”.
	+ FFS on column “Need of FR1/FR2 differentiation”.

**Issue 2-1-2: Applicability for UE capability of L3 report after SCell activation command**

* Option 1 (Apple, HW):
	+ appliable for single SCell activation, single PUCCH SCell activation, and multiple SCell activation with/without PUCCH SCell
* Recommended WF
	+ Agree on option 1.

### Sub-topic 2-2 UE capability of beam sweeping factor reduction for L3 and L1 (X1 and X2)

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 2-2-1: UE capability of beam sweeping factor reduction** **for L3 and L1 (X1 and X2)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** |
| 31. NR\_RRM\_enh3 | 31-2 | Beam sweeping factor reduction for FR2 unknown SCell activation | Option 1: Per band (Apple, CTC, Ericsson, MTK, HW, OPPO)Option 2: Per FS (i.e., per-band-per-BC) (vivo)Option 3: Per UE (CMCC) | Option 1: TDD only (Apple, MTK) | Option 1: FR2 only (Apple, MTK) |

* Recommended WF
	+ Agree on option1 for column “Need of FDD/TDD differentiation” and “Need of FR1/FR2 differentiation”.
	+ FFS on column “Type”.

**Issue 2-2-2: Applicability for UE capability of beam sweeping factor reduction for L3 and L1 (X1 and X2)**

* Option 1(Apple): Two beam sweeping factor reduction capability for L3 and L1, respectively, to indicate beam sweeping factor capability of X1 for cell detection part (X1\*Trs) and beam sweeping factor capability of X2 for SSB based L1-RSRP measurement.
* Recommended WF
	+ Agree on option 1.

### Sub-topic 2-3 UE capability of “using SSB periodicity instead of SMTC” and “perform L1-RSRP measurement in non-DRX mode even DRX is configured”

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 2-3-1: UE capability of “using SSB periodicity instead of SMTC” and “perform L1-RSRP measurement in non-DRX mode even DRX is configured”**

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| --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** |
| 31. NR\_RRM\_enh3 | 31-3 | Other measurement enhancement for unknown SCell activation, including:(1) Support of using SSB periodicity instead of SMTC periodicity during SCell activation(2) Perform L1-RSRP measurements with the delay assuming non-DRX during SCell activation even DRX is configured | Option 1: Per UE (Apple, MTK)Option 2: Per band (OPPO) | Option 1: No (Apple, CMCC, MTK) | Option 1: No (Apple, CMCC, MTK)Option 2: Yes (vivo) |

* Recommended WF
	+ [Moderator]: MTK R4-2321005 divided this UE capability into two separated capability FG31-3 “using SSB periodicity instead of SMTC” and FG31-4 “perform L1-RSRP measurement in non-DRX mode even DRX is configured”, but based on the following agreement in last meeting, moderator put these two features into one single FG31-3.
		- “using SSB periodicity instead of SMTC” and “perform L1-RSRP measurement in non-DRX mode even DRX is configured” shall be defined in one single feature group (FR) of feature list
	+ Agree on option1 for column “Need of FDD/TDD differentiation”.
	+ FFS on column “Type” and “Need of FR1/FR2 differentiation”.

# Topic #3: RRM performance requirements for FR2 SCell activation delay reduction

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318651**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318651.zip) | Apple | Proposal 1: feature of “Use SSB periodicity instead of SMTC periodicity” and “Performing L1-RSRP measurement in non-DRX mode even DRX is configured” can be verified in:* dedicated test cases for FR1 SCell activation;
* test cases of “beam sweeping factors reduction” for FR2 SCell activation.

Proposal 2: In TC for “L3 measurement reporting after SCell activation command”, * UL grant of L3 measurement is scheduled before Y= THARQ + 3ms + [M]ms, and the M is as agreed below in RAN4#108bis WF
* Configure the following conditions in TC to make UE report valid L3 result:
	+ MeasCycleScell=160ms with no DRX configured; and
	+ CSSF = 1, i.e., only single MO is configured on target SCC; and
	+ The SSB measured remains detectable according to the cell identification conditions specified in clause 9.2; and
	+ the SCell has been configured for a time period longer than the measurement period for intra-frequency measurement on deactivated SCell in Table 9.2.5.2-3 and 9.2.5.2-4, provided the SCell is detected and the side condition Ês/Iot ≥ -2dB is fulfilled; or
	+ the SCell has been configured for a time period longer than Tidentify intra with index or Tidentify intra without index defined in clause 9.2.5.1 or clause 9.2.6.2, provided the SCell is newly configured in deactivated state.

Proposal 3: In TC for “Rx beam sweeping factor reduction (X1 and X2)”, * to verify the reported L1-RSRP result can meet the accuracy requirements specified in TS38.133 clause 10.1.20.1/2.
* to verify beam sweeping factor reduction of X1 and X2 in the same test case.

Proposal 4: Regarding the different NR operation modes (EN-DC, NR-DC, NR-CA etc.), UE only needs to pass test in one mode (e.g., EN-DC, or NR CA, or NR-DC) to verify this enhancement. * unknown SCell in FR1 for EN-DC with FG31-1
* unknown SCell in FR1 for EN-DC with FG31-3
* unknown SCell in FR2 for EN-DC with FG31-1
* unknown SCell in FR2 for EN-DC with FG31-2 and FG31-3
* unknown SCell in FR1 (FR1+FR1 NR CA) with FG31-1
* unknown SCell in FR1 (FR1+FR1 NR CA) with FG31-3
* unknown SCell in FR2 (FR1+FR2 NR CA) with FG31-1
* unknown SCell in FR2 (FR1+FR2 NR CA) with FG31-2 and FG31-3

where, FG31-1: L3 reporting during activation, FG31-2: beam sweeping factor reductionFG31-3: “Use SSB periodicity instead of SMTC periodicity” + “Performing L1-RSRP measurement in non-DRX mode even DRX is configured”. |
| [**R4-2319008**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319008.zip) | Nokia, Nokia Shanghai Bell | Proposal #1: RAN4 to confirm the L3 report and L1 report shall fulfill the existing accuracy requirements:* + The L3 report after SCell activation command, if triggered, shall fulfil the accuracy requirements as specified in TS 38.133 clause 10, in particular clause 10.1.2.1 (for FR1) and 10.1.3.1 (for FR2).
	+ When the UE indicates a smaller sweeping factor X2, the L1-RSRP report shall fulfil the accuracy requirements as specified in in TS38.133 clause 10.1.19.1 (for FR1) and clause 10.1.20.1 (for FR2), irrespective of the value of sweeping factor X2.

Proposal #2: The performance requirements for L3 report and L1 report needs to be verified in the test cases. Proposal #3: To allow different values of *MeasCycleSCell* in test configuration. Proposal #4: RAN4 to define at least the following test cases for R18 FR2 SCell activation enhancement solutions:* FR2/FR1 unknown SCell activation with L3 report
* FR2/FR1 unknown SCell activation with smaller beam sweeping factors
* PUCCH SCell activation delay with L3 report
* PUCCH SCell activation delay with smaller beam sweeping factors
* Multiple SCell activation delay with FR2 unknown SCell with L3 report
* Direct SCell activation delay with smaller beam sweeping factors
 |
| [**R4-2319100**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319100.zip) | CMCC | Proposal 1: for FR2 SCell activation delay reduction, it is proposed to define test for following enhancement:* L3 measurement report after SCell activation command
* RX beam sweeping factor reduction
* using SSB periodicity instead of SMTC periodicity
* performing L1-RSRP measurement in non-DRX mode even DRX is configured

Proposal 2: it is necessary to define test cases for both FR1 and FR2 SCell activation delay reduction.Proposal 3: it is proposed to define test to verify that the L1-RSRP measurement with reduced beam sweeping factor fulfil the accuracy requirements specified in TS38.133 clause 10.1.20.1.Proposal 4: for L3 reporting based enhancement, it is proposed to define tests for following scenarios:* SCell activation
* direct SCell activation
* multiple SCell activation (with and without PUCCH SCell)
 |
| [**R4-2319357**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319357.zip) | Huawei, HiSilicon | Observation 1: Test cases to verify the performance of enhancement solutions shall be defined separately (i.e. different enhancement solutions are not verified jointly in the same test case)Proposal 1: For L3 measurement reporting triggered by SCell activation command, only define test case when L3 measurement is reported before TCI configuration.Proposal 2: Define test cases for beam sweeping factor reduction for X1 and X2 in the same test case.Proposal 3: Define dedicated test cases for following enhancement:* Use SSB periodicity instead of SMTC periodicity when the SMTC is only configured in MO for enhanced unknown FR2 Scell activation requirement
* L1-RSRP measurement is performed in non-DRX mode even DRX is configured

Observation 2: Regarding the test case setup for L3 report after SCell activation, the measurement period of the to-be-activated SCell shall be properly selected. The measurement period should not be too long to avoid invalid result for SCell actvation. At the same time, the measurement period should not be too short. It should leave enough flexibility for NW configuration and UE power saving.Proposal 4: For L3 report after SCell activation, the test setup shall guarantee that UE shall report valid L3 result for SCell activation when the measurement period is no longer than 12800 ms.Proposal 5: For FR2 SCell activation with L3 report, RAN4 to define test cases in table II.Proposal 6: It should be guaranteed that time period between the time point when SCell is configured and the time point when the SCell is activated shall be larger than Tidentify\_intra\_with\_index. |
| [**R4-2319472**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319472.zip) | OPPO | Proposal 1: Support to consider the following test cases for FR2 unknown SCell activation enhancement.:

|  |  |
| --- | --- |
| Core requirement | Test case |
| L3 report based enhancement | TC1: FR2 unknown SCell activation with enhanced L3 report |
| Beam sweeping factors reduction | TC2: FR2 unknown SCell activation with reduced beam sweeping factors |

 |
| [**R4-2319519**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319519.zip) | China Telecom | Observation 1: Since the enhancements for different scenarios including multiple Scell activation, direct SCell activation, PUCCH SCell activation, are expanded from the enhancements for FR2 unknown SCell activation with “L3 measurement reporting after SCell activation command” and “Rx beam sweeping factor reduction (X1 and X2)”, it’s not necessary to design test case for all scenarios.Proposal 1: Index 1 “FR2 unknown SCell activation with L3 report” and Index 5 “FR2 unknown SCell activation with smaller beam sweeping factors” in the test case list are sufficient.Proposal 2: The enhancements that “use SSB periodicity instead of SMTC periodicity” and “performing L1-RSRP measurement is performed in non-DRX mode even DRX is configured” can be verified in TCs with “Rx beam sweeping factors reduction”.Proposal 3: For the details of TC for “Rx beam sweeping factor reduction (X1 and X2)”, it’s preferred to design test case for Rx beam sweeping factor reduction (X1 and X2) in the same test case.Proposal 4: NR operation mode including NR SA, EN-DC, NR-DC for the TCs can be considered. However, if only one mode is considered, NR SA need to be prioritized. |
| [**R4-2320430**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320430.zip) | ZTE Corporation | Proposal 1: Regarding the enhancement L3 report after SCell activation command, to design test cases for as below.

|  |  |  |
| --- | --- | --- |
| Feature | Index | Test case |
| L3 report based enhancement | 1 | FR2 unknown SCell activation with L3 report |
| 2 | PUCCH SCell activation delay with L3 report |
| 3 | Multiple SCell activation delay with FR2 unknown SCell with L3 report |
| 4 | PUCCH SCell activation delay with L3 report with Multiple SCells |

Proposal 2: Within all the cases in which the beam sweeping reduction is applicable, pick some cases to test the beam sweeping reduction, not need to test under each case.Proposal 3: Within all the cases in which the the enhancements of “Using SSB periodicity instead of SMTC” and “Perform L1-RSRP measurement in non-DRX mode even DRX is configured” is applicable, pick some cases to test these enhancements, not need to test under each case.Proposal 4: Multiple modes should be considered, including FR1 NR CA, FR2 NR CA, FR1+FR2 NR CA, FR1 EN/NR-DC, FR1+FR2 EN/NR-DC, FR2 NR-DC. |
| [**R4-2320486**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320486.zip) | Qualcomm Incorporated | Proposal: Single TC is enough to validate L3 reporting based enhancement for each FR1 and FR2 unknown SCell activation per certain operation mode(s). Proposal: Single TC is enough to validate beam sweeping factor reduction for FR2 unknown SCell activation per certain operation mode(s). Proposal: “Use SSB periodicity instead of SMTC periodicity” and “Performing L1-RSRP measurement is performed in non-DRX mode even DRX is configured” enhancements can be verified in TCs with “beam sweeping factors reduction”. Proposal: RAN4 can consider following test environment to check UE to report valid L3 report as1. NW configure MO for to-be activated SCell with short MeascycleScell (E.g 160ms or 320ms)
2. NW does not configure report configuration for the MO.
3. Time gap between receiving Scell addition and Scell activation command is larger than 4s.
4. Test whether UE can follow new types of reporting configuration for L3 report after receiving SCell activation command.
 |
| [**R4-2320767**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320767.zip) | Ericsson | Proposal 1: RAN4 to define the test cases for at least following scenarios or requirements• SCell Activation Delay Requirement for Deactivated SCell with the L3 reporting during activation• Direct SCell Activation at SCell addition• SCell Activation Delay Requirement for Deactivated SCell with Multiple Downlink SCells with the L3 reporting during activation• SCell Activation Delay Requirement for Deactivated PUCCH SCell (for beam sweeping factor reduction)• Measurement reporting requirements Proposal 2: RAN4 to perform the tests for EN-DC, NR-DC and SA scenarios |
| [**R4-2321006**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2321006.zip) | MediaTek inc. | Proposal 1: Test cases for L3 report triggering and beam sweeping factor reduction:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Feature | Index | Test case | This TC is needed | This TC is NOT needed | Detailed Scope |
| L3 report based enhancement | 1 | FR2 unknown SCell activation with L3 report | CMCC, Nokia, Apple, Ericsson, QC, MTK |  | TBA |
| 2 | PUCCH SCell activation delay with L3 report | CMCC, Nokia | Apple, QC, MTK | TBA |
| 3 | Multiple SCell activation delay with FR2 unknown SCell with L3 report | CMCC, Nokia  | Apple, QC, MTK | TBA |
| 4 | PUCCH SCell activation delay with L3 report with Multiple SCells | CMCC, Ericsson | Apple, QC, MTK | TBA |
| Beam sweeping factors reduction | 5 | FR2 unknown SCell activation with smaller beam sweeping factors | Nokia, CMCC, Apple, QC, MTK |  | TBA |
| 6 | Multiple SCell activation delay with FR2 unknown SCell with smaller beam sweeping factors | CMCC, Ericsson | Apple, QC, MTK | TBA |
| 7 | PUCCH SCell activation delay with smaller beam sweeping factors | Nokia, CMCC, Ericsson | Apple, QC, MTK | TBA |
| 8 | PUCCH SCell activation delay with L3 report with Multiple SCells | CMCC | Apple, QC, MTK | TBA |
| 9 | Direct SCell activation delay with smaller beam sweeping factors at SCell addition | CMCC, Nokia, Ericsson | Apple, QC, MTK | TBA |
| 10 | Direct SCell activation delay with smaller beam sweeping factors at Handover | CMCC, Nokia | Apple, QC, MTK | TBA |
| 11 | Direct SCell activation delay of Multiple Downlink SCells with smaller beam sweeping factors at SCell addition | CMCC | Apple, QC, MTK | TBA |
| 12 | Direct SCell activation delay of Multiple Downlink SCells with smaller beam sweeping factors at Handover | CMCC | Apple, QC, MTK | TBA |

Proposal 2: In FR2 unknown SCell activation with L3 report test case, use M = 4ms + X1\*Tssb+X2\*Tssb for the time delay requirement (i.e., based on SSB periodicity).Proposal 3: Use the following NR operation mode for the TCs* Unknown SCell in FR2 for EN-DC with the L3 reporting during activation
* Unknown SCell in FR2 (FR1+FR2 NR CA) with the beam sweeping factor reduction

Proposal 4: No need to have separate test cases to verify “Use SSB periodicity instead of SMTC periodicity” and “Performing L1-RSRP measurement is performed in non-DRX mode even DRX is configured”. These enhancements can be included with the test case used for verifying reduced beam sweeping factor. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions..*

### Sub-topic 3-1 performance requirement

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 3-1-1: Performance requirement design**

* Proposal (Nokia): RAN4 to confirm the L3 report and L1 report shall fulfill the existing accuracy requirements:
	+ The L3 report after SCell activation command, if triggered, shall fulfil the accuracy requirements as specified in TS 38.133 clause 10, in particular clause 10.1.2.1 (for FR1) and 10.1.3.1 (for FR2).
	+ When the UE indicates a smaller sweeping factor X2, the L1-RSRP report shall fulfil the accuracy requirements as specified in in TS38.133 clause 10.1.19.1 (for FR1) and clause 10.1.20.1 (for FR2), irrespective of the value of sweeping factor X2.
* Recommended WF
	+ [Moderator]: if we need such clarification in proposal 1, we can discuss to capture them directly into the draft CR for the corresponding activation delay requirement.

### Sub-topic 3-2 Test case design

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 3-2-1: Generic configuration for all TCs**

* Proposal 1 (Nokia):
	+ The performance requirements for L3 report and L1 report needs to be verified in the test cases.
	+ To allow different values of MeasCycleSCell in test configuration.
* Proposal 2 (CMCC):
	+ it is necessary to define test cases for both FR1 and FR2 SCell activation delay reduction.
* Recommended WF
	+ To check if above proposals are agreeable.

**Issue 3-2-2: Configure to have valid L3 report in TC for “L3 measurement reporting after SCell activation command”**

* Option 1 (Apple):
	+ UL grant of L3 measurement is scheduled before Y= THARQ + 3ms + [M]ms, and the M is as agreed below in RAN4#108bis WF
	+ Configure the following conditions in TC to make UE report valid L3 result:
		- MeasCycleScell=160ms with no DRX configured; and
		- CSSF = 1, i.e., only single MO is configured on target SCC; and
		- The SSB measured remains detectable according to the cell identification conditions specified in clause 9.2; and
		- the SCell has been configured for a time period longer than the measurement period for intra-frequency measurement on deactivated SCell in Table 9.2.5.2-3 and 9.2.5.2-4, provided the SCell is detected and the side condition Ês/Iot ≥ -2dB is fulfilled; or
		- the SCell has been configured for a time period longer than Tidentify intra with index or Tidentify intra without index defined in clause 9.2.5.1 or clause 9.2.6.2, provided the SCell is newly configured in deactivated state.
* Option 2 (HW):
	+ For L3 measurement reporting triggered by SCell activation command, only define test case when L3 measurement is reported before TCI configuration.
	+ For L3 report after SCell activation, the test setup shall guarantee that UE shall report valid L3 result for SCell activation when the measurement period is no longer than 12800 ms.
	+ It should be guaranteed that time period between the time point when SCell is configured and the time point when the SCell is activated shall be larger than Tidentify\_intra\_with\_index.
* Option 3 (QC):
	+ NW configure MO for to-be activated SCell with short MeascycleScell (E.g 160ms or 320ms)
	+ NW does not configure report configuration for the MO.
	+ Time gap between receiving Scell addition and Scell activation command is larger than 4s.
	+ Test whether UE can follow new types of reporting configuration for L3 report after receiving SCell activation command.
* Option 4 (MTK):
	+ In FR2 unknown SCell activation with L3 report test case, use M = 4ms + X1\*Tssb+X2\*Tssb for the time delay requirement (i.e., based on SSB periodicity).
* Recommended WF
	+ TBA. Options may not mutual exclusive with each other.

**Issue 3-2-3: TC for “Rx beam sweeping factor reduction (X1 and X2)”**

* Proposal 1:
	+ to verify the reported L1-RSRP result can meet the accuracy requirements specified in TS38.133 clause 10.1.20.1/2. (Apple, CMCC)
	+ to verify beam sweeping factor reduction of X1 and X2 in the same test case. (Apple, HW, CTC, QC)
* Proposal 2 (ZTE):
	+ Within all the cases in which the beam sweeping reduction is applicable, pick some cases to test the beam sweeping reduction, not need to test under each case.
* Recommended WF
	+ To check if above proposals are agreeable.

**Issue 3-2-4: whether dedicated TC is needed for “Use SSB periodicity instead of SMTC periodicity” and “Performing L1-RSRP measurement is performed in non-DRX mode even DRX is configured”?**

* Option 1 (HW):
	+ Yes, define dedicated test cases for following enhancement:
		- Use SSB periodicity instead of SMTC periodicity when the SMTC is only configured in MO for enhanced unknown FR2 Scell activation requirement
		- L1-RSRP measurement is performed in non-DRX mode even DRX is configured
* Option 2 (CTC, QC, MTK):
	+ No, the enhancements that “use SSB periodicity instead of SMTC periodicity” and “performing L1-RSRP measurement is performed in non-DRX mode even DRX is configured” can be verified in TCs with “Rx beam sweeping factors reduction”.
* Option 3 (Apple, CTC):
	+ Yes for FR1 and No for FR2. Feature of “Use SSB periodicity instead of SMTC periodicity” and “Performing L1-RSRP measurement in non-DRX mode even DRX is configured” can be verified in:
		- dedicated test cases for FR1 SCell activation;
		- test cases of “beam sweeping factors reduction” for FR2 SCell activation.
* Recommended WF
	+ [Moderator]: Please companies check if option 3 could be a compromise because there is no beam sweeping factor reduction TC for FR1.

**Issue 3-2-5: NR operation mode for the TCs, e.g., EN-DC, NR-DC, NE-DC and SA**

* Option 1 (Apple):
	+ Regarding the different NR operation modes (EN-DC, NR-DC, NR-CA etc.), UE only needs to pass test in one mode (e.g., EN-DC, or NR CA, or NR-DC) to verify this enhancement.
		- unknown SCell in FR1 for EN-DC with FG31-1
		- unknown SCell in FR1 for EN-DC with FG31-3
		- unknown SCell in FR2 for EN-DC with FG31-1
		- unknown SCell in FR2 for EN-DC with FG31-2 and FG31-3
		- unknown SCell in FR1 (FR1+FR1 NR CA) with FG31-1
		- unknown SCell in FR1 (FR1+FR1 NR CA) with FG31-3
		- unknown SCell in FR2 (FR1+FR2 NR CA) with FG31-1
		- unknown SCell in FR2 (FR1+FR2 NR CA) with FG31-2 and FG31-3
* Option 2 (CTC):
	+ NR operation mode including NR SA, EN-DC, NR-DC for the TCs can be considered. However, if only one mode is considered, NR SA need to be prioritized.
* Option 3 (ZTE):
	+ Multiple modes should be considered, including FR1 NR CA, FR2 NR CA, FR1+FR2 NR CA, FR1 EN/NR-DC, FR1+FR2 EN/NR-DC, FR2 NR-DC.
* Option 4 (Ericsson):
	+ RAN4 to perform the tests for EN-DC, NR-DC and SA scenarios
* Option 5 (MTK): Use the following NR operation mode for the TCs
	+ Unknown SCell in FR2 for EN-DC with the L3 reporting during activation
	+ Unknown SCell in FR2 (FR1+FR2 NR CA) with the beam sweeping factor reduction

Note:

* FG31-1: L3 reporting during activation,
* FG31-2: beam sweeping factor reduction
* FG31-3: “Use SSB periodicity instead of SMTC periodicity” + “Performing L1-RSRP measurement in non-DRX mode even DRX is configured”.
* Recommended WF
	+ TBA.

**Issue 3-2-6: Candidate test case list based on proposals from companies**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Feature | Index | Test case | This TC is needed | This TC is NOT needed | FR1 or FR2 |
| FG31-1: L3 report based enhancement | 1 | FR2 unknown SCell activation with L3 report | Apple, Nokia, CMCC, OPPO, CTC, ZTE, QC, Ericsson, MTK |  | For FR2 |
| 2 | FR2 PUCCH SCell activation delay with L3 report | Nokia, ZTE | Apple, MTK | For FR2 |
| 3 | Multiple SCell activation delay with FR2 unknown SCell with L3 report | Nokia, CMCC, ZTE, Ericsson | Apple, MTK | For FR2 |
| 4 | FR2 PUCCH SCell activation delay with L3 report with Multiple SCells | CMCC, ZTE | Apple, MTK | For FR2 |
| 5 | FR1 unknown SCell activation with L3 report | Apple, Nokia, QC, CTC |  | For FR1 |
| 6 | FR1 PUCCH SCell activation delay with L3 report | Ericsson | Apple | For FR1 |
| 7 | Multiple SCell activation delay with FR1 unknown SCell with L3 report | Ericsson | Apple | For FR1 |
| 8 | FR1 PUCCH SCell activation delay with L3 report with Multiple SCells |  | Apple | For FR1 |
| FG31-2: Beam sweeping factors reduction | 9 | FR2 unknown SCell activation with FG31-2 and FG31-3 | Apple, Nokia, CMCC, OPPO, CTC, QC, MTK |  | For FR2 (FG31-3 in this TC is up to issue 3-2-4) |
| 10 | Multiple SCell activation delay with FR2 unknown SCell with FG31-2 and FG31-3 |  | Apple, MTK | For FR2(FG31-3 in this TC is up to issue 3-2-4) |
| 11 | FR2 PUCCH SCell activation delay with FG31-2 and FG31-3 | Nokia, Ericsson | Apple, MTK | For FR2(FG31-3 in this TC is up to issue 3-2-4) |
| 12 | FR2 PUCCH SCell activation delay with FG31-2 and FG31-3 with Multiple SCells |  | Apple, MTK | For FR2(FG31-3 in this TC is up to issue 3-2-4) |
| 13 | FR2 Direct SCell activation delay with FG31-2 and FG31-3 at SCell addition | Nokia, CMCC, Ericsson | Apple, MTK | For FR2(FG31-3 in this TC is up to issue 3-2-4) |
| 14 | FR2 Direct SCell activation delay with FG31-2 and FG31-3 at Handover | Nokia, CMCC, Ericsson | Apple, MTK | For FR2(FG31-3 in this TC is up to issue 3-2-4) |
| 15 | FR2 Direct SCell activation delay of Multiple Downlink SCells with FG31-2 and FG31-3 at SCell addition |  | Apple, MTK | For FR2(FG31-3 in this TC is up to issue 3-2-4) |
| 16 | FR2 Direct SCell activation delay of Multiple Downlink SCells with FG31-2 and FG31-3 at Handover |  | Apple, MTK | For FR2(FG31-3 in this TC is up to issue 3-2-4) |
| FG31-3: (1)Use SSB periodicity instead of SMTC periodicity” (2)“Performing L1-RSRP measurement in non-DRX mode even DRX is configured” | 17 | FR1 unknown SCell activation with FG31-3 | Apple, CMCC, CTC, Ericsson |  | For FR1 |
| 18 | Multiple SCell activation delay with FR1 unknown SCell with FG31-3 |  | Apple | For FR1 |
| 19 | FR1 PUCCH SCell activation delay with FG31-3 |  | Apple | For FR1 |
| 20 | FR1 PUCCH SCell activation delay with FG31-3 with Multiple SCells |  | Apple | For FR1 |
| 21 | FR1 Direct SCell activation delay with FG31-3 at SCell addition |  | Apple | For FR1 |
| 22 | FR1 Direct SCell activation delay with FG31-3 at Handover |  | Apple | For FR1 |
| 23 | FR1 Direct SCell activation delay of Multiple Downlink SCells with FG31-3 at SCell addition |  | Apple | For FR1 |
| 24 | Direct FR2 SCell activation delay of Multiple Downlink SCells with FG31-3 at Handover |  | Apple | For FR1 |
| 25 | FR2 unknown SCell activation with FG31-3 |  | Apple | For FR2(need this TC or not is up to issue 3-2-4) |
| 26 | Multiple SCell activation delay with FR2 unknown SCell with FG31-3 |  | Apple | For FR2(need this TC or not is up to issue 3-2-4) |
| 27 | FR2 PUCCH SCell activation delay with FG31-3 |  | Apple | For FR2(need this TC or not is up to issue 3-2-4) |
| 28 | FR2 PUCCH SCell activation delay with FG31-3 with Multiple SCells |  | Apple | For FR2(need this TC or not is up to issue 3-2-4) |
| 29 | FR2 Direct SCell activation delay with FG31-3 at SCell addition |  | Apple | For FR2(need this TC or not is up to issue 3-2-4) |
| 30 | FR2 Direct SCell activation delay with FG31-3 at Handover |  | Apple | For FR2(need this TC or not is up to issue 3-2-4) |
| 31 | FR2 Direct SCell activation delay of Multiple Downlink SCells with FG31-3 at SCell addition |  | Apple | For FR2(need this TC or not is up to issue 3-2-4) |
| 32 | Direct FR2 SCell activation delay of Multiple Downlink SCells with FG31-3 at Handover |  | Apple | For FR2(need this TC or not is up to issue 3-2-4) |

**Note: the color code in above table is only for differentiating FR1 and FR2 TCs.**

* Recommended WF
	+ [Moderator]: Please companies feel free to fill your name into the above table to facilitate the discussion.
	+ [Moderator]: In order to control the TC number, moderator proposes to keep the most essential TCs, and therefore recommend companies to check if:
		- TC2 can be indirectly verified by other activation cases ( i.e., legacy PUCCH SCell activation TCs and TC1)
		- TC3 can be indirectly verified by other activation cases ( i.e., legacy multiple SCell activation TCs and TC1)
		- TC4 can be indirectly verified by other activation cases ( i.e., legacy PUCCH SCell activation TCs (with multiple DL SCell) and TC1)
		- And so on

**Issue 3-2-7: Further detailed test case list for “L3 report based enhancement” after conclusion on issue 3-2-6**

* Proposal (HW):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Index | Test case | Test configuration | This TC is needed | This TC is not needed |
| 1 | FR2 unknown SCell activation with L3 report with FR1 PCell | Cell 1: FR1 PCell, Cell 2: FR2 to-be-activated SCell | Apple |  |
| 2 | FR2 unknown SCell activation with L3 report with FR1 PCell and FR1 SCell | Cell 1: FR1 PCell, Cell2: FR1 SCell, Cell 3: FR2 to-be-activated SCell |  | Apple |
| 3 | FR2 unknown SCell activation with L3 report with FR2 PCell | Cell 1: FR2 PCell, Cell 2: FR2 to-be-activated SCell | Apple |  |
| 4 | FR2 unknown PUCCH SCell activation with L3 report with FR1 PCell  | Cell 1: FR1 PCell, Cell 2: FR2 to-be-activated SCell |  | Apple |
| 5 | FR2 unknown PUCCH SCell activation with L3 report with FR1 PCell and FR1 SCell | Cell 1: FR1 PCell, Cell2: FR1 SCell, Cell 3: FR2 to-be-activated SCell |  | Apple |
| 6 | FR2 unknown PUCCH SCell activation with L3 report with FR2 PCell | Cell 1: FR2 PCell, Cell 2: FR2 to-be-activated SCell |  | Apple |
| 7 | Multiple FR2 unknown SCell activation with L3 report with FR1 PCell | Cell 1: FR1 PCell, Cell 2 and Cell 3 (same FR2 band): FR2 to-be-activated SCell |  | Apple |
| 8 | Multiple FR2 unknown SCell activation with L3 report with FR1 PCell and FR1 SCell | Cell 1: FR1 PCell, Cell2: FR1 SCell, Cell 3 and Cell 4 (same FR2 band): FR2 to-be-activated SCell |  | Apple |
| 9 | Multiple FR2 unknown SCell activation with L3 report with FR2 PCell | Cell 1: FR2 PCell, Cell 2 and Cell3 (same FR2 band): FR2 to-be-activated SCell |  | Apple |
| 10 | FR2 unknown PUCCH SCell and multiple SCell activation with L3 report with FR1 PCell | Cell 1: FR1 PCell, Cell 2 and Cell 3 (same FR2 band): FR2 to-be-activated SCell/PUCCH SCell |  | Apple |
| 11 | FR2 unknown PUCCH SCell and multiple SCell activation with L3 report with FR1 PCell and FR1 SCell | Cell 1: FR1 PCell, Cell2: FR1 SCell, Cell 3 and Cell 4 (same FR2 band): FR2 to-be-activated SCell/PUCCH SCell |  | Apple |
| 12 | FR2 unknown PUCCH SCell and multiple SCell activation with L3 report with FR2 PCell | Cell 1: FR2 PCell, Cell 2 and Cell3 (same FR2 band): FR2 to-be-activated SCell/PUCCH SCell |  | Apple |

* Recommended WF
	+ [Moderator]: it could be discussed after conclusion on issue 3-2-5 and 3-2-6. But moderator still encourages companies to fill their views into the above table.